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RESEARCH NOTE NOR-13

February 1966

A TEST OF PRUNING SITKA SPRUCE IN ALASKA

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Knot-free Sitka spruce (*Picea sitchensis* (Bong.) Carr.) lumber is valuable for many specialty items. Clear wood is now obtained from large, overmature, naturally pruned trees. Natural pruning of Sitka spruce proceeds slowly because branches are resinous and resist decay. Since the expected rotation age of second-growth stands is 120 years or less, artificial pruning will be necessary if maximum knot-free wood production is desired in the future.

An exploratory pruning test began in 1951 in a 38-year-old Sitka spruce-western hemlock stand at Skowl Arm, Prince of Wales Island, Alaska. Test objectives were to determine the time required for pruning and to investigate wound healing.

Pruning was done during May 1951 in connection with experimental thinning on nine 0.4-acre plots. Average site-index of the plots was 124 feet at 100 years. After thinning, plot density varied from 278 to 602 trees per acre with Sitka spruce making up 83 percent of the plot basal area. Pruned trees averaged 9.2 inches in diameter breast height, with eight pruned whorls of four limbs each. Limbs averaged 3/4 inch in diameter. All pruned branches were dead.

METHODS

From 14 to 19 of the best Sitka spruce crop trees on each plot were pruned. Limbs were pruned to a height of 17 feet on the stems by workmen using 3 tools; an axe was used to a convenient height, then an 8-foot pole saw and, finally, a 14-foot pole saw. Each worker kept a time record.

In 1964, 13 years after pruning, 3 pruned trees on each plot were cut and sample disks were removed. Samples were later sectioned through knots and examined for wound healing and evidence of decay. Six randomly selected pruned trees on each plot were also inspected for epicormic branches.

RESULTS

Thirteen years after pruning, branch stubs had healed over completely except where splintered and incompletely severed by the axe, or where incompletely cut by the saw. Branches had been dead from 4 to 16 years when pruned. When small branches on the lower part of stems were pruned, up to 3 inches of enclosed loose branch resulted. Virtually all wounds were clearly marked on the exterior of stems by black masses of hardened resin, even when wounds were completely healed.

Clear wood production over smooth branch cuts began 5 to 12 years after pruning, depending upon tree growth, branch size, and stub length. Saw cuts were usually smooth while axe cuts were more often ragged and required longer to heal. Of 40 wounds examined in detail, one showed a slight blue-grey sap staining extending about 0.6 inches from the wound. In this case a splintered section of branch was incompletely healed over. Wood appeared to be sound near the wound (fig. 1).

Figure 1.--Wound healing 13 years after pruning of 38-year-old Sitka spruce --(1, 2) saw-pruned, (3, 4) axe-pruned. Note incomplete healing and staining in sample (1) where branch was incompletely severed. Samples (2-4) contain enclosed bark but healing is complete.

Growth layers often bulged outward over branch stubs, particularly where bark was included, but the grain appeared to be smoothing out with time. A resinous patch up to three inches in diameter often surrounded branch stubs in the first annual wood layer after pruning. In a transverse or cross section these patches appeared as a thin streak with small pockets of hardened resin.

An average of seven epicormic branches grew on each pruned tree, five of which were less than 1/4 inch in diameter. The largest measured was 3/4 inch in diameter. The number present at the time of pruning is not known.

Pruning time, including time required to walk between trees, averaged 6.8 minutes per tree (range 5.6-8.0 minutes).

DISCUSSION

In this test of dead-limb pruning, wounds healed rapidly with little evidence of decay. Similar results, with little or no infection after pruning both dead and live limbs of Sitka spruce, have been reported recently in Great Britain[1/] and Norway[2/]. British tests also showed that knots healed more quickly when stem diameter was smaller, and that live-pruned branches healed faster than dead-pruned.

In the test reported here, the stand was beyond the optimum age for pruning. Earlier pruning would reduce the size of knotty cores and should speed wound healing because branches would then be smaller.

Epicormic branches may occur profusely on the stems of Sitka spruce trees exposed to increased light after thinning.[3/] Although epicormic branches occurred here, their numbers or vigor did not appear to be related to differences in stand density, perhaps because stocking on all plots was high. Reduction in value because of the small, tight knots associated with epicormic branches is not known.

Future pruning studies should be confined to stands in their first or second decade of growth, and should include both dead and live pruning.

1/ Henman, D. W. Pruning conifers for the production of quality timber. Brit. Forestry Comm. Bul. 35, 55 pp., illus., 1963.

2/ Bauger, E., and Orlund, A. A study of pruned trees of Sitka spruce, *Abies grandis*, western hemlock, Norway spruce, and *Thuja plicata*. Medd. Vestland. Forstl. Forsokssta. 11(4)36, pp. 169-197. 1962.

3/ Herman, F. R. Epicormic branching of Sitka spruce. U. S. Forest Serv. Res. Paper PNW-18, 9 pp., illus. 1964.

GPO 990-152